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ABSTRACT

In July 1981, Utah Technical College (UTC) conducted a survey of businesses in the Salt Lake City area to gather information for the development of a curriculum integrating computer applications with business course instruction. The survey sought to determine the status and usage of current micro/mini computer equipment, future data processing acquisition plans, and the perceived importance of applied data processing instruction in business courses. Questionnaires were mailed to 335 small, medium, and large businesses in the areas of agriculture, mining, construction, manufacturing, transportation, wholesale, retail, finance, and services. Study findings, based on an 86% response rate, revealed that: (1) 79% of the firms were using computers for business applications; (2) 51% of the firms planned to obtain a new computer within 5 years; (3) the major business areas in which computers were used were accounts payable and receivable, general ledger, and payroll; (4) 34% of the respondents indicated that their software programs were internally developed, and 31% used both packaged and internally developed programs; (5) 56.7% of the firms employed their own computer programmer, and 33.6% contracted for programming; and (6) 80% of the respondents considered the inclusion of applied data processing in business courses to be of major importance. Based on the findings, it was recommended that UTC revise its business course curricula to include data processing instruction. The questionnaire is appended. (HB)

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BUSINESS USE OF SMALL COMPUTERS
IN THE SALT LAKE CITY, UTAH AREA

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Salt Lake City, Utah
September, 1981

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BUSINESS USE OF SMALL COMPUTERS
IN THE SALT LAKE CITY, UTAH AREA

INTRODUCTION

The "computer invasion" has only just begun. There are currently over 200,000 personal computers in use today, with an estimated use of 500,000 by 1985. Prognosticators predict that by 1990, 80% of U.S. dwellings will have microcomputers¹ and there will exist over 10 million microprocessors.²

The rapid advance of technology has initiated a growth in the availability and adoption of micro-computers and mini-computers analogous to the era of the hand-held electronic calculator. How many of us use slide-rules today? The brief resistance by educators to "allow" the use of electronic calculators in the classroom was short lived. Interestingly enough, few formal educational classes were offered which specifically taught people how to use their hand-held electronic calculators. One of the more pragmatic reasons for this lack of formal training, was the extremely wide diversity and capability in the variety of calculators owned by students and the public at large. And, calculators were easy to operate. If a person's math background was fundamental, so was the calculator they acquired, and used. If a person was into calculus, trigonometry, analytic geometry, accounting and finance, there are more sophisticated calculators to meet a person's calculation needs.

¹"What Next 20 Years Hold for You", U.S. News & Word Report, December 1, 1980, p. 52.

²De Vore, Paul W. "1981 and Counting", Journal of the American Vocational Association, Vol. 56, No. 2, March 1981, pg. 29.

While computers are more sophisticated than hand-held calculators, we are seeing a rapid expansion of hardware and software which will serve the needs of users through increasing productivity. Microprocessors will increasingly be used in automating America's production processes.³ The result will be an increasing number of displaced workers needing retraining and/or upgraded skills. Among the skills to be learned is computer literacy. Curriculum changes will be necessary to provide students with the skills to maintain their employability in the job markets of the 1980's. In addition to computer literacy, integration of computer applications into existing business courses has been recommended.⁴

One approach to beginning the process of curriculum change is to examine what computer equipment is available.

Shopping for a micro or mini computer is extremely confusing. The wide variety of hardware, software, and peripheral equipment compounds the problem of what seems to be a foreign language comprised of jargon and acronyms. As Dr. Stocker is frequently quoted "...it is a jungle out there!"⁵

³Op cit.

⁴Alexander, W. J. Microcomputers: Impact on Society and Education, Business Education Forum, Vol. 35, No. 6, May, 1981, pg. 19.

⁵Stocker, Bob. Microcomputer Study Report, March 24, 1981. Unpublished Manuscript, Department of Business Education, Utah State University, Logan, Utah.

The development of a curriculum for business students that integrates computer equipment and software becomes especially problematic because of this "jungle." A primary mission of Utah Technical College is to prepare its students to be functionally productive in their future occupations. It would be impossible, from a fiscal standpoint, to acquire one of every type of computer equipment available. Even more impossible, would be the curriculum development and personnel necessary to use such a vast variety of computer programs and equipment for instructional purposes. The anticipated growth in Utah's labor market for managers, clerical personnel, and sales positions⁶ support the necessity of upgrading business curricula. Projections for total annual openings in three of the business occupational areas to 1986 is shown in Table 1.

TABLE 1

Annual Openings for Managers, Clerical Personnel, and Sales Positions in Utah for 1981 and 1986

	<u>1981</u>	<u>1986</u>	<u>% Changes</u>
Managers and Officers	54,290	72,360	33%
Clerical	109,470	142,620	30%
Sales	38,500	51,220	33%

⁶Randell, E. O., and Arrington, P. Occupational Employment Projections Utah and Utah Planning Districts 1981-1986, Labor Market Information Services, Utah Department of Employment Security, June, 1981.

Because of the anticipated rapid five year growth, a process of curriculum development is vital to the future careers of business students and employer needs in Utah.

Complicating the process of curriculum development, in attempting to determine what equipment and software local businesses are using, is the information provided by computer sales representatives. Computer "Salesmen" make grand sounding claims for their equipment, and its usage in industry. Examination of journals and reports reveals a lack of information with regard to what kind of computer equipment and software programs are currently used by industry. Specifically lacking is information on Utah Tech's primary employment market regarding computer equipment and its applications to business activities.

Purposes of the Study

Information is needed to provide a basis for curriculum development for integrating computer applications with instruction of business courses. The kind of information sought by this study are as follows:

1. To determine, by manufacturer, the current mini and micro data processing equipment in use by businesses in the Salt Lake City, Utah Area.
2. Identify the existing state of planning, by firms, as to future acquisition of computers.

3. Assess the accounting, financial, and management areas for which businesses are currently using their existing mini/micro computers.
4. Identify whether current mini/micro computer users have purchased "packaged" software, or have had specialized software programs written specifically for their use.
5. To identify if users of mini/micro computers, who have specialty programs, contract programming or employ their own programmer and the type(s) of computer language(s) utilized by the mini/micro computers.
6. Measure the perceived importance Salt Lake Area businesses place on including applied data processing instruction for future business students.

Methodology

To accomplish the purposes of this study a mail questionnaire was developed. (Ref. Appendix A). The questionnaire was divided into three sections:

1. Current equipment and usage status.
2. Future data processing acquisition plans.
3. Perceived importance of applied data processing instruction in business courses.

The questionnaire was reviewed by a panel of four experts to improve the instrument and establish face validity. Mr. Jerry Fullmer, Director of Computer and Information Services and Dr. R. H. Hansen, Instructor and curriculum developer for the data processing program at Utah Technical College provided valuable suggestions for improved wording. Mr. Charles M. Lutz and Dr. Robert H. Stocker, professors of Business Education at Utah State University confirmed the integrity of the questionnaire. In addition, Mr. Gary Cole, Associate Dean of Business Occupations assisted in the review process and has supported the purposes of this study.

Design of the Study

The study utilized survey research methods. The target population was all business firms identified in the three volume Dun & Bradstreet, Million Dollar Directory, 1980-81 in the Salt Lake City, Utah area. Towns and cities included in the population were: Bountiful, Draper, Midvale, North Salt Lake, Salt Lake City, and Sandy. A total of 689 business firms were identified for the target population.

Population Stratification

Business firms were stratified by type and size. Nine (S.I.C.) Standard Industrial Classification categories were used to identify the type of business operation. In addition, the population was further stratified by size of firm. Two criteria were used to classify firms by size, as shown in Table 2.

TABLE 2
Population Stratification Criteria

<u>SIZE</u>	<u>ANNUAL SALES</u>	<u>NUMBER OF EMPLOYEES</u>
Small	< \$1 million	< 25
Medium	> \$1 million and < \$10 million	> 25 and < 100
Large	> \$10 million	> 100

The resulting stratification resulted in a nine-by-three matrix, for 27 cells, as shown in Table 3.

Sample

A computer generated random sample was selected, using the DEC 2060 computer at Utah Technical College. An attempt was made to maintain at least a 20% sample for each stratified cell. If a cell had 17 or less, the entire population for that cell was sampled which included one cell of 17 subjects. For those cells whose population was larger than 18, a sample of 15 was randomly selected. The intent of this sampling design was to survey at least 15 per cell, where possible, in an attempt to achieve a minimum response rate of ten per cell. A total of 335 firms were sampled, as shown in Table 4.

TABLE 3
TARGET POPULATION FOR EACH STRATIFIED CELL BY S.I.C. AND SIZE OF FIRM
STANDARD INDUSTRIAL CLASSIFICATION
(S.I.C.)

SIZE OF FIRM	1 AGRICULTURE FORESTRY & FISHERIES	2 MINING	3 CONSTRUCTION	4 MANUFACTURING	5 TRANSPORTATION COMMUNICATIONS & UTILITIES	6 WHOLESALE	7 RETAIL	8 FINANCE, INSURANCE & REAL ESTATE	9 SERVICES	SUB TOTAL
SMALL	6	11	62	20	10	47	31	114	35	336
MEDIUM	3	1	31	42	7	47	34	27	17	209
LARGE	0	5	13	25	15	22	36	19	9	144
TOTAL	9	17	106	87	32	116	101	160	61	689

TABLE 4
SAMPLE SIZE FOR EACH STRATIFIED CELL BY S.I.C. AND SIZE OF FIRM
STANDARD INDUSTRIAL CLASSIFICATION
(S.I.C.)

SIZE OF FIRM	1 AGRICULTURE FORESTRY & FISHERIES	2 MINING	3 CONSTRUCTION	4 MANUFACTURING	5 TRANSPORTATION COMMUNICATIONS & UTILITIES	6 WHOLESALE	7 RETAIL	8 FINANCE, INSURANCE & REAL ESTATE	9 SERVICES	SUB TOTAL
SMALL	6	11	15	15	10	15	15	23	15	125
MEDIUM	3	1	15	17	7	15	15	15	17	105
LARGE	0	5	13	18 *	15	15	15	15	9	105
TOTAL	9	17	43	50	32	45	45	53	41	335

* Represents one firm having three distinct subsidiaries

Cover Letters

A letter (see Appendix B) explaining the purpose of the survey was mailed on July 29, 1981. The letter was addressed to the Chief Executive Officer, President, or manager as listed in the Dun & Bradstreet Million Dollar Directory, 1980-81. The purpose of directing the survey materials to the firm's chief officer was to obtain an authoritative response from the top executive, who either could respond or would delegate the task to the appropriate organizational level.

Follow-up

Sample subjects who did not respond to the initial mailing by August 11, 1981 were contacted by telephone. Non-respondents who agreed to participate were sent a second survey. Address and contact person changes, discovered in the telephone follow-up, were used to update the sampling frame.

Invalid Sample Subjects

A total of twenty sample subjects were determined to be invalid. For surveys which were returned to sender, telephone contacts were made to determine the correct address. Twenty of the returned surveys had phones disconnected. The new 1981-82 area telephone directory had no listing for those twenty firms. Table 5 displays the type and size of firms considered invalid by the researcher.

TABLE 5

Invalid Sample Subjects by SIC Category and Size of Firm

SIC CATEGORY	SIZE OF FIRM		
	Small	Medium	Large
1. Agriculture	1	0	0
2. Mining	1	0	0
3. Construction	3	2	1
4. Manufacturing	1	2	0
5. Transportation Communications & Utilities	0	0	0
6. Wholesale	0	0	0
7. Retail	0	0	0
8. Finance, Insurance & Real Estate	4	1	0
9. Services	3	1	0
TOTAL	13	6	1

Final Sample

Due to the twenty invalid sample subjects a total of 315 sample subjects were considered valid.

Questionnaire Returns

All returned questionnaires were examined and verified to the sample mailing list. A code sheet was prepared and the questionnaire responses were keypunched on cards and verified. A printout of the data was examined for keypunch errors and checked against a sample of the questionnaire returns.

Statistical Procedures

A program using the statistical package for Social Sciences (SPSS) was developed. The data was processed by the DEC 2060 computer at Utah Technical College at Salt Lake. Descriptive statistics were used to analyse the data. Analysis of various (ANOVA) and a t-test was used to determine differences between means of respondent groups on their perception of the importance of data processing instruction in business courses.

FINDINGS

The goal of this study was to determine the extent of mini and micro-computer usage and application by businesses in the Salt Lake City area.

The purpose of this section is to present the findings of the statistical analysis of the data collected in the study.

Number of Questionnaires Returned

Three hundred and thirty five questionnaires were mailed to businesses in the Salt Lake City area. A random sample of 335 from a sampling frame of 689 represented a 49% sample. However, twenty of those firms sampled were considered invalid. The twenty deletions from the original sample resulted in a final sample of 315 business firms surveyed. A total of 271 completed questionnaires were returned resulting in a return of 86%.

Table 6 displays the final sample and returns for businesses surveyed by SIC and size of firm.

There were three cells in which the preferred return rate was less than 70%: medium size firms in agriculture; small construction firms; and medium size transportation, communication and utility firms may have questionable statistical inference due to the low return rate. Overall, the high return rate and large proportion of stratified cells (89%) achieving a return rate in excess of 70% suggests a high level of inference to the population surveyed.

TABLE 6
QUESTIONNAIRE RETURNS

(SIC) STANDARD INDUSTRIAL CLASSIFICATION	SIZE OF FIRM									TOTAL
	SMALL			MEDIUM			LARGE			
	NUMBER SAMPLED	NUMBER OF RETURNS	PERCENTAGE OF RETURNS	NUMBER SAMPLED	NUMBER OF RETURNS	PERCENTAGE OF RETURNS	NUMBER SAMPLED	NUMBER OF RETURNS	PERCENTAGE OF RETURNS	
1. Agriculture Forestry & Fisheries	5 **	4	80%	3	1	33% *	0	0	N/A	5
2. Mining	10 **	9	90%	1	1	100%	5	4	80%	14
3. Construction	12 **	7	58% *	13 **	10	77%	12 **	11	92%	28
4. Manufacturing	14 **	13	93%	15 **	15	100%	18	18	100%	46
5. Transportation Communication & Utilities	10	10	100%	7	3	43% *	15	13	87%	26
6. Wholesale	15	13	87%	15	12	80%	15	14	93%	39
7. Retail	15	15	100%	15	13	87%	15	12	80%	40
8. Finance Insurance & Real Estate	19 **	15	79%	14 **	12	86%	15	13	87%	80
9. Services	12 **	9	75%	16 **	15	94%	9	9	100%	33
TOTAL	112	95	85%	99	82	83%	104	94	90%	271

* Return less than 70%

** Samples reduced by invalid sample subjects (Ref. Tables 4 and 5).

Purpose 1. To determine, by manufacturer, the current mini and micro data processing equipment in use by businesses in the Salt Lake City, Utah area.

Item 2 of the questionnaire requested respondents to indicate whether the firm owned/leased a mini or micro (small) computer. A total of 141 (52%) responded affirmatively to item 2. Telephone follow-up discussions with principally medium and large size firms indicated that some of the firms had a full size mainframe computer and did not respond to questions 2, 2a-2e and 3. Questionnaire item 3 requested respondents who indicated no, to owning/leasing a mini or micro computer in item 2, were asked to indicate if they subscribed to a computer service firm. A total of 73 (27%) responded affirmatively to item 3. Thus, at least 214 of the 271 respondents, or 79% are using computers for business applications.

Questionnaire item 2a requested the respondents to identify the manufacturer and model of mini/micro computer owned/leased by the responding firm. The manufacturer, but very few of the model of computers, were reported. Table 7 displays the number of mini and micro computers by manufacturer reported, by respondents. Table 7 also displays the number of firms reporting owning/leasing more than one mini/micro computer.

TABLE 7

Manufacturer of Mini/Micro Computers Reported Owned/Leased by Respondent Firms and Multiple Units Owned/Leased.

Manufacturer	Number of First Computer	Number of Second Computers	Number of Third Computers	Total
Apple	6	0	0	6
Burroughs	9	0	0	9
DEC	10	1	0	11
Hewlett-Packard	2	1	0	3
Honeywell	6	1	0	7
IBM	30	3	1	34
NCR	2	0	0	2
Prime	1	0	0	1
Radio Shack TRS 80	4	0	0	4
Texas Instruments	3	4	0	7
Univac	2	0	0	2
Wang	5	1	0	6
Other	60	11	4	75
Total	140	22	5	167

There was one missing response to questionnaire item 2a. Examination of Table 7 reveals that IBM has 34 (20%) of the mini/micro computers in operation in the business firms surveyed. Fully 75 (45%) were other manufacturers, which covered a wide variety of models as listed in Table 8.

Based upon the computer manufacturers reported by respondents, there were as total of 48 different mini/micro computers in use among the subjects sampled.

TABLE 8

Other Mini/Micro Computers Manufacturers Reported by Respondents.

<u>MANUFACTURER</u>	<u>FREQUENCY</u>
BASIC IV	8
Data General	6
Information Now	6
Nixdorf	6
Microdata	5
Data Point	3
Diablo	3
General Automation	3
Reynolds & Reynolds	3
Adam	2
Digidyne	2
Lockheed	2
NBI	2
Qantel	2
ADP	1
Alpha Micro	1
Beehive	1
BTI	1
Compucor	1
Computer Systems Dynamics	1
Control Data	1
Dobson	1
Eagle Eptak	1
KADO	1
Litton	1
Microtronics	1
Oak Leaf	1
Ohio Scientific	1
Pertek	1
Phillips	1
Tandem	1
Tektronics	1
Triad	1
Zeda	1
Zietron	1
<u>TOTAL</u>	<u>75</u>

Examination of the data reveals that of the 95 small firms who responded, 26 (27.4%) reported owning/leasing mini/micro computers. The 82 medium size firms who responded reported 50 (61.0%) owning/leasing mini/micro computer(s). The 94 large size firms who responded reported 65 (69.1%) owning/leasing mini/micro computer(s).

A breakdown of firms who indicated owning/leasing mini/micro computer(s) by industry classifications (SIC) and size of firm is displayed in Table 9. Table 9 also shows the relative frequency of ownership by SIC and size of firm.

Purpose 2. Identify the existing state of planning, by firms, as to future acquisition of computers.

Item 4, of the questionnaire, asked respondents to indicate their future plans to acquire a new computer within the next five years. A total of 137 (51%) responded that they planned to obtain a new computer within five years.

Questionnaire item 4a requested respondents to indicate the manufacturer and model they planned to acquire, if known. There were 41 (30%) of the respondents who indicated the manufacturer of the computer they planned to acquire. There were 96 (70%) who responded that the manufacturer was unknown at the time of responding to the question.

Purpose 3. Assess the accounting, financial, and management areas for which businesses are currently using their existing mini/micro computers.

Those respondents who reported that their firm owned/leased a mini/micro computer were requested to report the kind of business applications on their computers (questionnaire item 2e). Table 10 displays the business applications and the frequency of response to which the computer is utilized.

TABLE 10
Computerized Business Applications

<u>BUSINESS APPLICATIONS</u>	<u>FREQUENCY</u>	<u>PERCENT OF FIRMS WHO HAVE MINI-MICRO COMPUTERS</u>
Accounts Payable	109	77.3%
Accounts Receivable	115	81.6%
Budgeting Management Planning	68	42.2%
Cost Accounting	72	51.1%
Cost/Bid Estimation	30	21.3%
Files/Mailing Lists	79	56.0%
Fixed Assets/Depreciation	71	50.4%
General Ledger	112	79.4%
Graphics	11	7.8%
Inventory	83	58.9%
Investment Analysis	19	13.5%
Operations Research	21	14.9%
Payroll	112	79.4%
Statistical Analysis	53	37.6%
Word Processing	40	28.4%
Other Management uses	36	25.5%

The direct accounting functions of accounts payable, accounts receivable, cost accounting, fixed assets, depreciation, general ledger, inventory, and payroll all exceed 50 percent utilization. Graphics,

investment analysis and operation research are low with less than 15% utilization. Word processing applications were 28.4 percent. Management applications of budgeting-management planning, cost-bid estimation, and statistical analysis were 42.2, 21.3, and 37.6 percent respectively. Other management uses at 25.5% reflected specialized applications based upon telephone follow-up discussions, such applications included sales reports, engineering applications, expense account reports, and other specialized programs.

Table 11 describes by industry classification (SIC) and size of firm the business applications, as a percent of respondents, reporting owning/leasing mini/micro computer(s). Examination of table 11 reveals the extent to which businesses who own/lease mini/micro computers utilize their equipment for various business applications.

Purpose 4. Identify whether current mini/micro computers users have purchased "packaged" software, or have had specialized software programs written specifically for their use.

Businesses that responded owning/leasing mini/micro computers were asked to identify the source of their software programs. Item 2b, of the questionnaire, requested respondents to indicate if their software programs were purchased from the dealer in packaged form and/or developed internally by being programmed for their specific operations. There were 47 (34.3%) who responded their software programs were developed internally for their specific use. In addition, there were 43 (31.4%) who indicated their software programs were both packaged and internally developed. There were four missing responses.

TABLE 11

Relative Frequency of Computerized Business Applications by SIC and Size of Firm

BUSINESS APPLICATION	2			3			4			5			6			7			8			9		
	MINING			CONSTRUCTION			MANUFACTURING			TRANSPORTATION & UTILITIES			WHOLESALE			RETAIL			FINANCE INSURANCE & REAL ESTATE			SERVICE		
	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L
Accounts Payable	100%	--	50%	--	100%	100%	50%	63%	83%	80%	67%	67%	71%	89%	75%	40%	73%	100%	100%	57%	60%	50%	100%	100%
Accounts Receivable	100%	--	0	--	100	75	50	50	100	100	100	78	100	100	92	100	82	91	75	57	40	50	83	100
Budgeting																								
Management Planning	100	--	50	--	33	75	0	88	58	80	67	56	29	44	75	40	36	45	25	14	50	50	50	80
Cost Accounting	0	--	50	--	67	100	0	63	58	80	67	56	57	33	42	20	36	36	100	14	30	50	83	100
Cost/Bid Estimation	0	--	0	--	67	50	0	13	25	20	67	0	14	0	17	20	9	9	25	43	30	50	17	20
Files/Mailing List	100	--	50	--	17	50	0	25	67	60	67	67	29	56	92	80	45	45	50	71	50	50	67	80
Fixed Asset/Depreciation	100	--	50	--	67	100	50	25	50	20	67	78	57	56	42	10	45	36	50	29	40	50	83	100
General Ledger	100	--	50	--	100	100	50	63	83	80	67	78	71	89	92	80	55	91	100	86	50	50	100	100
Graphics	0	--	50	--	0	0	0	13	0	0	0	44	0	0	13	0	0	9	0	0	10	50	17	20
Inventory	0	--	50	--	50	0	0	50	75	0	33	33	86	100	92	80	64	91	50	14	40	50	83	40
Investment Analysis	0	--	0	--	0	25	0	13	0	0	0	11	14	11	8	20	9	9	20	14	10	100	17	0
Operations Research	0	--	0	--	17	0	0	0	13	20	0	50	0	11	17	0	29	0	20	14	40	50	0	0
Payroll	100	--	100	--	100	100	50	63	83	80	100	44	71	89	92	80	73	100	100	57	50	50	100	100
Statistical Analysis	100	--	50	--	33	75	0	13	33	20	33	67	29	33	33	20	55	18	50	57	30	100	33	40
Word Processing	100	--	0	--	0	50	0	37	67	40	0	44	0	33	17	40	18	27	75	29	30	100	17	40
Other Management Uses	0	--	100	--	0	0	0	25	42	40	0	44	0	0	17	40	36	9	25	43	60	50	17	0

S = Small Firms
M = Medium Firms
L = Large Firms

Purpose 5. To identify if users of mini/micro computers, who have specialty programs, contract programming or employ their own programmer and the type(s) of computer language(s) utilized by the programmer(s).

Respondents who indicated owning/leasing mini/micro computer(s) were asked if they employed their own programmer or contracted for programming. Responses to item 2c, of the questionnaire, were 76 (56.7%) employed their own programmer, while 45 (33.6%) contracted their computer programming. There were 12 respondents who reported not employing their own programmer and one who responded that they did not contract their programming. There were seven missing responses.

The type of programming language used was requested in item 2d of the questionnaire. Table 12 displays the programming language, frequency of response and proportion of responses for each language indicated.

TABLE 12
Programming Languages Used

PROGRAMMING LANGUAGE	FREQUENCY	RELATIVE FREQUENCY
BASIC	67	34.5%
PASCAL	2	1.0%
COBOL	41	21.1%
RPG/RPG II	29	15.0%
FORTRAN	10	5.2%
ASSEMBLER	22	11.3%
Other	23	11.9%
TOTAL	194	100.0%

There were 19 missing responses. Additionally, there were multiple responses indicating that more than one programming language was used on the computer(s) owned/leased by the responding firm. There were 21 responding two languages, 17 with three languages, three with four languages, and two with five languages in use.

Purpose 6. Measure the perceived importance Salt Lake Area businesses place on including applied data processing instruction for future business students.

Item 5, of the questionnaire, requested respondents to indicate how they perceived the importance of including applied data processing instruction for students in business courses. A Likert scale was used to record responses with a scale of: 1 = No Importance to 5 = Extremely Important.

The average (mean) importance was $\bar{x} = 4.275$, with a standard deviation of $s = .909$. The median was 4.539 with a mode of 5.000. The distribution was negatively skewed at -1.232. There were 140 responding 5-Extremely important, 77 responding 4-Major importance. Thus, 217 (80%) of the respondents perceived the importance to be of major importance or extremely important for including applied data processing instruction in business courses.

A t-test for differences between respondent groups owning/leasing and not owning/leasing mini/micro computers on the means of their perceived importance of applied data processing instruction in business courses was accomplished. There was a statistically significant difference between the two groups as displayed in Table 13.

TABLE 13

T-Test Results for Differences Between Firms Reporting Owning/Leasing and Not Owning/Leasing Mini/Micro Computer(s) on the Means of their Perceived Importance of Applied Data Processing Instruction in Business Courses.

<u>DEPENDENT VARIABLE</u>	<u>GROUPS</u>	<u>NUMBER OF CASES</u>	<u>MEAN</u>	<u>STANDARD DEVIATION</u>	<u>T-VALUE</u>	<u>2-TAILED PROBABILITY</u>
Importance of Data Processing Instruction	Own/Lease	141	4.404	0.845	2.45	0.015
	Do Not					
	Own/Lease	130	4.133	0.959		

While there is a statistically significant difference, the non-own/lease group reported mean is in excess of 4 (4.132), or of major importance.

A one-way analysis of variance (ANOVA) was used to test for differences between sizes of firms on the means of their perceived importance of data processing instruction in business courses. To identify where differences between means existed, a Tukey test was applied at the .05 level. No statistically significant differences were found between small, medium, and large firms. All of the groups had a reported mean in excess of 4.0.

A one-way analysis of variance (ANOVA) was used to test for differences between types of industries (SIC) on the means of their perceived importance of data processing instruction in business courses. To identify where differences between means existed, a Tukey test was applied at the .05 level. Table 14 displays the results of the analysis of variance.

TABLE 14

One-Way Analysis of Variance for Means of the Nine SIC's on their Perceived Importance of Data Processing Instruction in Business Courses.

<u>SOURCE</u>	<u>d.f.</u>	<u>Sum of Squares</u>	<u>Mean Squares</u>	<u>F-Ratio</u>	<u>F-Probability</u>
Between Groups	8	12.2859	1.5357	1.907	0.0592
Within Groups	262	209.3572	0.8052		
TOTAL	270	221.6431			

While the F-probability was not statistically significant at the .05 level, but nearly so, the Tukey test did locate a statistically significant group. The Agriculture Forestry and Fisheries industry group had a reported mean of $\bar{x} = 4.800$, which was significantly higher than any other industry. All of the industry groups had perceived means above 4 (major importance) of providing applied data processing instruction in business courses.

CONCLUSIONS AND RECOMMENDATIONS

This section provides the conclusions based upon the findings of the study. The section then concludes with recommendations for using the findings and further research implications of the study.

Conclusions

This section will present the conclusions based upon the characteristics of the sample and the findings of the purposes of the study.

Characteristics of the Sample

Examination of the returns by SIC and size of firm resulted in the conclusion that proportionally, there are very few Agricultural firms in the area surveyed. The high response rate (86%) provides a significant degree of confidence for inferring population characteristics from the sample statistics. Only three cells; (1) small size construction firms (58%), (2) medium size Transportation, Communication and Utilities (43%), and (3) medium size Agriculture (33%) have marginal predictability.

Purposes

Purpose 1. To determine the brands of mini and micro computers in use.

A limitation of this study was in not asking respondents to indicate owning/leasing full size mainframe computers. Thus, the

responses of 52 percent owning/leasing mini/micro computers and 27 percent contracting for computer services is significant. While it can be stated that at least 79 percent of Salt Lake area businesses are using computers for business applications, those firms who use full size computers are not included in the respondent group. Speculation, by the researcher, would place the proportion of businesses using computers closer to 85 or 90 percent.

In terms of the kind of mini/micro computer(s) used by business firms, there appears to be no concentration of a few brands used more than any other type. Of the 167 mini/micro computers reported, there are 48 different brands.

IBM has the largest concentration with 20 percent of the total number reported. This large variety of brands of computers in use is significant, and compounds the problem for educational institutions in making computer brand purchasing decisions. One fact is clear, that there is extensive use of mini/micro computers used for business applications in the Salt Lake business community.

While only 27.4 percent of small businesses used mini/micro computers, it may be expected that small business firms will increase their adoption of computers in business operations. A high proportion of medium size firms (61%) and large size firms (69.1%) use mini/micro computers in their business activities. Telephone discussions indicated that many firms had full size computers and used their mini/micro computers for specialized applications including control activities and executive security. Other firms reported use of mini/micro computers in decentralized operations.

Purpose 2. Identify firms who plan to acquire a new computer in the next five years.

A significant proportion (51%) plan to acquire a new computer in the next five years. There are technological implications of this fact for educators. If over 50% of the respondent firms see the need to acquire new computers, education must consider the effects of the business community using newer, technologically more advanced equipment in curriculum planning.

Fully 30 percent who plan to acquire new computers were able to identify the brand of computer. This would suggest that several firms are in the advanced planning stages of new computer acquisition.

Purpose 3. Assess the computerized business applications currently in use.

The accounting functions appear to be the most widely adapted to respondents computers. However, there appears to be some differences due to the type of industry and size of businesses (ref. Table 11). An example is that Inventory programs are infrequently used in Construction and Transportation, Communications and Utilities. Inventory is much more extensively used in medium and large size Manufacturing firms, and the Wholesale and Retail industries. Small and medium size service firms appear to be using their computers extensively for the inventory function.

Management analysis programs such as budgeting and statistical analysis is in use in approximately 40 percent of the firms. Telephone

discussions repeatedly indicated that businesses not using their computers for management analysis planned to increase their computer usage for those purposes.

Interestingly, word processing applications is used by only 28.4% of the mini/micro computers reported by respondents. Several firms indicated in telephone conversations that their firms had specific word processing equipment not reported in the survey. Therefore, the extent of business use of computerized word processing cannot be determined from the data collected.

More sophisticated computer programs for managers such as operations research and investment analysis is not extensively used. Speculation on the reasons for this lack of usage may include lack of training and skills by managers and a lack of understandable software programs to accomplish those functions. However, 15 and 13 percent usage, respectively, suggests that those functions are being applied in business operations at least in some degree.

Other management uses of respondents computers were over 25 percent. This suggests that specific business operations have specialized programming needs.

Purpose 4. Identify the source of computer software programs in use.

The source of software programs is equally divided between packaged (of-the-shelf), and specialized programming. Further, a nearly equal number reported purchasing packaged software and having specialized programming accomplished. Telephone conversations indicated that packaged software programs frequently had to be modified to adapt to the

particular firm's operations. Others indicated that several packaged software programs needed were not available.

Purpose 5. Identify if users of mini/micro computers employ their own programmer or do contract programming.

There were 56.7 percent of the firms who reported that they employ their own programmer, while 33.6 percent contracted their computer programming. This would suggest a need for computer programmers in light of the findings of purpose 3 and 4. With the large proportion of firms planning to acquire new computers, and a large proportion who employ their own programmers, a significant growth in employment demands may be anticipated. This conclusion has serious implications for institutions of higher education in the Salt Lake area. The need for increased training of computer programmers would require increased facilities, equipment, and teachers.

The type of programming language used resulted in some interesting discoveries. Basic appeared to be the most frequently used, (34.5%) with Cobol, RPG/RPG II, and Assembler languages also frequently used. Pascal is used in only 1 percent of the cases and Fortran in only 5.2 percent of the cases. Telephone discussions did suggest that Pascal was being investigated for future use by at least three other firms. The category of "other" languages used reflects the wide range of computer brands for which specific computer manufacturers have developed computer languages compatible only to their equipment.

In terms of business applications, the Basic and Cobol language is the most predominantly used. This information has curriculum implications for educators in data processing programs.

Purpose 6. Measure the perceived importance businesses believe should be placed on applied data processing instruction in business courses.

Certainly the message is loud and clear. The entire business community surveyed perceive the instruction of applied data processing in business courses to be of major importance or higher. In all groups, by size of firm, SIC, and owners/leasers and non-owners/leasers of mini/micro computers, the mean response exceeded 4 (major importance). The implications for business educators is significant. Business curriculums should include applied data processing instruction. Many phone conversations with business firms suggested that business students should be trained as users (not programmers) of computerized business programs. The logic and process of computerized accounting programs was suggested as being significantly different from manual systems. Thus, students should be prepared to be productive in an environment which includes the computer as a major business tool.

Recommendations

The following recommendations are based upon the findings and conclusions of the study.

1. Because of the extensive use of computers (79%) in business operations, and businesses response that business courses should include applied data processing instruction as being of major importance, business course curricula should be revised to include such instruction. To accomplish the curriculum revision, the following items are recommended:

- a. The college administration should budget for computer equipment acquisition and upgrading for instructional purposes.
- b. A variety of software programs and specialized programming for business applications in accounting and management for instruction purposes should be included in the budgeting process.
- c. Budgeting for accounting and management instructors should be planned to:
 - (1) Develop user (instructor) skills on new and upgraded equipment and business software programs.
 - (2) Have released time and/or summer contracts to develop appropriate instructional methods of applied data processing, using information from this study.
 - (3) Support expansion of instructor skills through planned inservice programs.

While this research study has identified the what of businesses use of computers, the study does not answer the how of teaching computerized business applications. The era of the inexpensive business program appears to be concluding. Technology and advances in business applications are demanding competently trained personnel.

2. Funding requests for curriculum development should be made through the college's budgetary process. In addition, special funding proposals should be made through the State Board for Vocational Education. Further, Federal grants should be sought to assist in the curriculum development process.

3. While this study was directed at obtaining information to develop curriculum for business courses, there are important implications for data processing program curricula. It is recommended that data processing educators use information in this study for curriculum development.
4. The results of this study should be made available to interested parties, including educators and businesses. Specifically, the study should be provided to the Board of Regents and State Board for Vocational Education.

Recommendations for Further Research

The findings, and conclusions of this study are the basis for the following recommendations for further research.

1. While the intent of this study was to determine the extent of mini-micro computer applications, the number and kind of full size mainframe computers were not measured. It is recommended that further research be conducted to determine explicitly the extent of businesses use of computers in their operations.

2. The extent of word processing applications was not directly measureable. It is recommended that research be conducted to determine the extent to which businesses are using data processing equipment.
3. The business community is adopting the use of technologically advanced business equipment. A study should be conducted to identify the current status of office and business equipment usage, and the rate of change in the adoption of technological advances in office and business equipment.
4. Based upon the report that 51 percent of the respondent businesses plan to acquire a new computer in the next five years, this study should be repeated every two to three years. Current information from the business community is vital for sound curriculum development.

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APPENDIXES

SALT LAKE AREA BUSINESS SURVEY OF DATA PROCESSING
FOR USE BY UTAH TECHNICAL COLLEGE AT SALT LAKE

This survey is intended to identify the current and future use of computers by Salt Lake Area Businesses. The information will be used strictly for educational purposes.

1. What is your formal title? _____
2. Does your firm currently own/lease one or more mini or micro computer(s)? ☐ yes ☐ no
If yes, please answer questions 2a-2e.
- 2a. If yes, please identify the manufacturer(s) and list the model(s):

☐ Apple ☐ Burroughs ☐ Commodore ☐ DEC ☐ Hewlett Packard ☐ Honeywell ☐ IBM	model _____ model _____ model _____ model _____ model _____ model _____ model _____	☐ Northstar ☐ NCR ☐ Prime ☐ Radio Shack (TRS 80) ☐ Texas Instruments ☐ Univac ☐ Wang	model _____ model _____ model _____ model _____ model _____ model _____ model _____
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☐ Other _____ model _____
(manufacturer)
- 2b. In what form are your computer software programs?
☐ Packaged (Purchased from a dealer)
☐ Developed internally (Programmed specifically for your operations)
- 2c. Do you employ your own computer programmer? yes ☐ no ☐ /contract programming? ☐ yes ☐ no
- 2d. What language is used for programming your computer? (Please check all that apply)
☐ BASIC ☐ COBOL ☐ FORTRAN
☐ PASCAL ☐ RPG/RPG II ☐ ASSEMBLER ☐ OTHER _____ Please List
- 2e. In which business operations areas do you currently utilize computer programs?
(Please check all that apply.)

☐ Accounts Payable ☐ Accounts Receivable ☐ Budgeting (management planning) ☐ Cost Accounting ☐ Cost/Bid Estimation	☐ Files/Mailing Lists ☐ Fixed Assets (Depreciation) ☐ General Ledger ☐ Graphics ☐ Inventory	☐ Investment Analysis ☐ Operations Research ☐ Payroll ☐ Statistical Analysis ☐ Word Processing
---	--	---

☐ Other _____
(Please list)
3. If your firm does not own/lease it's computer, do you regularly subscribe for computer services?
☐ yes ☐ no
4. Whether you currently own a computer or not, do you plan to acquire a new computer within the next five years? ☐ yes ☐ no
- 4a. If yes, please list the manufacturer and model, if known. ☐ unknown

 (computer manufacturer)

 (model)
5. How important do you think it is for business students (other than data processing students) to have applied data processing instruction in their business courses? (Please circle one)

Not Important		Extremely Important
1	2	3
4	5	

THANK YOU FOR YOUR VALUABLE INPUT!
YOUR SUPPORT IS APPRECIATED!!

Please fold, staple and return to the address on the back of this survey.

Appendix B

Sample Cover Letter for the Survey

July 29, 1981

Mr. Businessman, Manager
Salt Lake Business
Any Street
Salt Lake City, Utah

Dear Mr. Businessman

You and your organization can contribute to some very important information needed to develop sound educational programs. Frequently, higher education is criticized for not being in touch with the "real business world." As the manager of your organization, your responses to the enclosed survey will assist Utah Technical College in making sound educational decisions to meet Utah's business needs.

The enclosed survey has been developed to assess the current status and future plans of businesses in the Salt Lake area with regard to mini and micro (small) computer utilization. Technology, as you are aware, is advancing at an extremely rapid rate. At Utah Technical College, we want to provide Utah's future work force with the skills which will be most productive. Therefore, we need to know what data processing applications you are using in your business.

We will appreciate your taking time in your busy schedule to respond to this brief survey. When you have completed the survey, fold and staple it so that the preposted business reply address is displayed for mailing.

Please return the survey by August 11, 1981. If you have any questions, feel free to call me at 967-4187. I will be looking forward to your response.

Respectfully

Dr. Michael M. Homer
Project Director

MMH:ms

Enclosure

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